

## Claims

1. An ion beam apparatus comprising:

a holder member which holds a sample; and

a removing beam source which irradiates a gaseous ion beam onto a processed surface of a sample held by the holder member and removes a fracture layer on the processed surface, the processed surface being formed by irradiating a focused ion beam,

wherein the gaseous ion beam is irradiated from a holding end side of the sample with respect to a direction vertical to the processed surface so that its irradiating direction is tilted with respect to the vertical direction.

2. The ion beam apparatus according to claim 1 comprising a processing beam source which irradiates a focused ion beam onto the sample held by the holder member and forms the processed surface.

3. The ion beam apparatus according to claim 1 or 2, wherein the gaseous ion beam is an inert gas ion beam.

4. The ion beam apparatus according to anyone of claims 1 to 3, wherein the holder member has a base part which is rotatably supported about a first axis in parallel with a horizontal direction, and a holding part which is rotatably disposed about a second axis orthogonal to the first axis at a tip end side of the base part and holds the sample.

5. The ion beam apparatus according to claim 4, wherein

the holder member has a drive module which rotates the holding part about the second axis.

6. The ion beam apparatus according to any one of claims 1 to 5 comprising an observation beam source which irradiates an electron beam onto the processed surface of the sample and observes the processed surface.

7. The ion beam apparatus according to any one of claims 2 to 6, wherein the processing beam source irradiates the focused ion beam from vertically above with respect to the sample.

8. An ion beam processing method comprising:

a first step of irradiating a focused ion beam onto a sample and forming a processed surface; and

a second step of irradiating a gaseous ion beam onto the processed surface of the sample and removing a fracture layer on the processed surface,

wherein at the second step, the gaseous ion beam is irradiated from a holding end side of the sample with respect to a direction vertical to the processed surface of the sample so that its irradiating direction is tilted with respect to the vertical direction.

9. The ion beam processing method according to claim 8, wherein the gaseous ion beam is an inert gas ion beam.

10. The ion beam processing method according to claim 8 or 9, wherein at the second step, the irradiating direction of the gaseous ion beam is varied with respect to the sample

for processing.

11. The ion beam processing method according to claim 10, wherein at the first step, the irradiating direction of the focused ion beam is varied with respect to the sample.

12. The ion beam processing method according to claim 10 or 11, wherein at the first step or the second step, the sample is moved with respect to the irradiating direction of the focused ion beam or the gaseous ion beam through a holder which holds the sample.

13. A holder member comprising:

a base part which is rotatably supported about a first axis in parallel with the horizontal direction; and

a holding part which is rotatably disposed about a second axis orthogonal to the first axis at a tip end side of the base part and holds a sample where a focused ion beam is irradiated to form a processed surface.

14. The holder member according to claim 13 comprising a drive module which rotates the holding part about the second axis.